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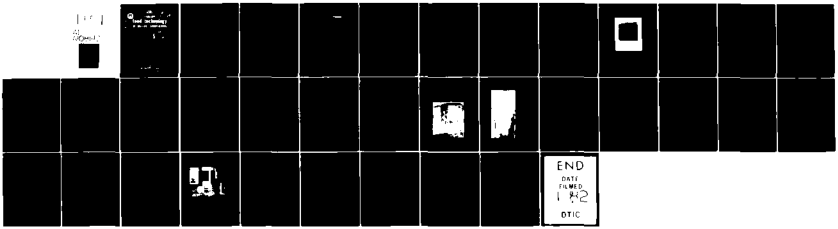

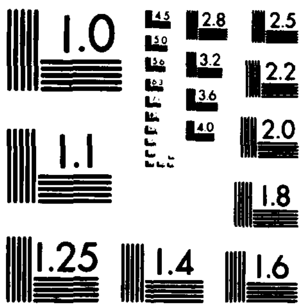

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FOREIGN food technology OF MILITARY SIGNIFICANCE

10 December 1981 Vol 5, No. 1

A quarterly report reviewing developments in foreign food and food-related technologies possessing military significance including food chemistry, [illegible] processing, nutrition, food service, rations, and field feeding equipment.

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DST-1810P-487-82-VOL 5-No. 1
18 December 1981

PREFACE

The purpose of this quarterly periodical is to report on the status and accomplishments of foreign military feeding systems and food-related technologies possessing military significance.

This issue features articles about aseptic processing, solar dehydration, shelf life extenders, military menu planning, new food laboratories devoted to military products and problems, rations, and nutrition.

The report was prepared by Mrs. Victoria Dibbern and Mr. Alan Krome, to whom technical questions may be addressed (AUTOVON 274-7433). Constructive criticisms, comments, or suggested changes are encouraged and should be forwarded to the Commander, US Army Foreign Science and Technology Center, 220 Seventh St., NE., Charlottesville, VA 22901 (ATTN: DRXST-PO). Prints of illustrations may be obtained by request to the same address.

DST-1810P-487-82-VOL 5-No. 1
18 December 1981

Development of Simple Solar Dehydrators for Drying Fruit and Vegetable Products

Researchers at the Central Mango Research Station, Indian Institute of Horticultural Research, Luchnow, India, have developed two models of solar dehydrators for the processing of agricultural produce. In a paper appearing in the Journal of Food Science and Technology[1] (published by the Association of Food Scientists and Technologists, India) authors S. K. Kalra and K. C. Bhardwaj describe the construction of two simple solar dehydrators and their use in small-scale food processing industries.

The goal of the researchers was to develop simple solar dehydrators that could be fabricated from common construction materials and built where needed with local labor. The only items dehydrated in the test program set up by the researchers were mangoes, peas, okra, and potatoes. All were grown at the research station and were representative of crops grown in the region.

The solar dehydrator, Model I (fig 1), is a modified version of a model originally developed by the University of Hawaii. Model I has two major components, a solar collector and a chamber to accommodate the product to be dried. The chamber located above the four long legs is designed to hold eight aluminum mesh trays, each 50x90 cm. There is a clearance of about 8 cm between trays. The total loading area is 3.6 m^2. The solar collector is placed at approximately a 45° angle. Air flow, important in any dehydration process, is controlled by sliding plates (6x60 cm) at the lower end of the solar collector and by an outlet. The plates (4 cm wide), are located on all four sides at the top of the chamber. All apertures are fitted with fine aluminum mesh to prevent insect entry. The construction of the Model I results in a chimney effect from the solar collector through the chamber. Air inside the chamber was measured at 10° to 20°C higher than outside air temperature. The solar collector has a glass plate on top; the bottom is a black painted iron sheet, insulated underneath with thermocol and plywood. The depth of this collector is 15 cm.

The solar dehydrator, Model II (fig 2), is designed and constructed so that the same chamber is both the solar collector and the dehydrator. This model held four trays (38x90 cm each), which are placed inside the collector at equal distances and parallel to the ground.

The air inlet and outlet are provided at the lower and upper ends of the collector. The temperature attained inside the dehydrator is 20° to 30°C higher than outside. The drying area is 2.4 m^2. The solar collector also has a glass plate on top and an iron bottom (painted black), also insulated underneath with thermocol and plywood.

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[1] Vol. 18, No. 1, Jan-Feb 1981, pp 23-26.

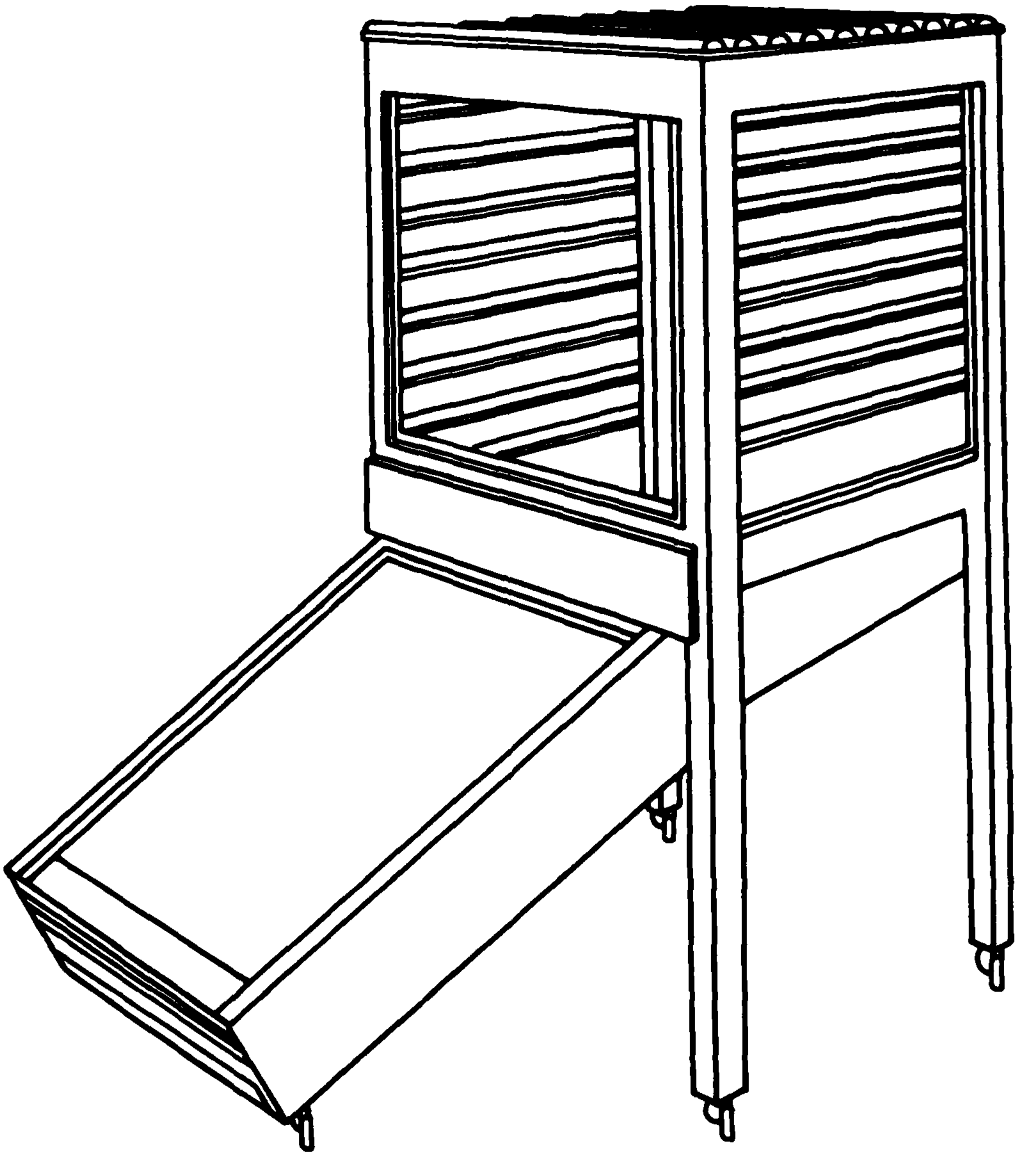

Figure 1. Solar Dehydrator, Model I

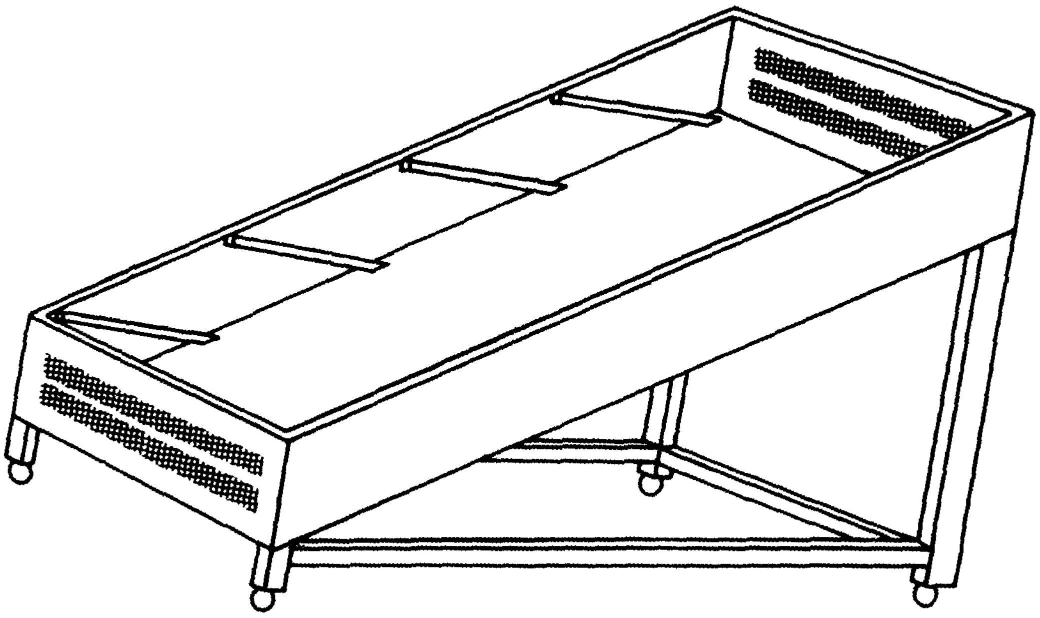

Figure 2. Solar Dehydrator, Model II

Table I shows how the researchers prepared their raw material for dehydration.

Initial moisture content was determined by drying in an oven at 70° to 72°C to a constant weight. Chemicals were used in the preparation process to help maintain texture and inhibit bacterial growth.

To evaluate the solar dehydrators, all products were dehydrated in both models. As a control, open air drying was used for comparison. Table II compares the results of the test.

Table I. Raw Material Preparation

Product	Preparation	Note
Mango slices (raw)	Raw mangoes, washed, peeled, cut into slices 4 to 5 mm thick, 30 to 40 mm long. Immersed for 10 minutes in 0.2% potassium metabisulfite (KMS) solution.	After dehydration, slices were powdered.
Mango slices (ripe)	Fully ripe mangoes, peeled and sliced 5 to 6 mm thick, 6 to 10 cm long. Dipped for 5 minutes in a solution of 0.4% $CaCl_2$ and 1.5% KMS.	
Mango leather (pulp)	Homogenized mango with KMS (equivalent to 150 ppm SO_2).	
Green peas	Pods shelled, peas split, and treated with 0.8% KMS for 5 minutes.	
Okra	Washed, wiped, and cut into 2-cm-long pieces.	
Potato chips	Potatoes washed, peeled, and sliced into 1-mm-thick slices. Blanched for 1 minute in 80° to 85°C water. Slices dipped for 10 minutes in a solution containing 0.3% $NaHSO_3$, 0.4% $CaCl_2$, and 1.0% NaCl.	Spread in single layer on dehydrator.
Potato fries	Wash and peel potatoes. Cut into 5 mm thick and 5- to 7-cm-long strips. Blanch for 10 minutes in 80° to 85°C water. Dip in a solution containing 0.3% $NaHSO_3$, 0.2% $CaCl_2$, and 1.0% NaCl for 10 minutes.	
Potato "papad" (mashed potatoes)	Potatoes washed and boiled for 30 minutes, then peeled and mashed with 1% fat plus a small quantity of salt and spices.	"Papad" of approximately 0.1-1 mm thickness and 10 cm diameter was prepared and spread on trays on the dehydrator.

Table II. Solar Dehydration Test and Conditions*

Material	Loading (kg/m^2)	Model I			Model II			Open air		
		Temp (°C)	Drying time (h)	Moisture (%)	Temp (°C)	Drying time (h)	Moisture (%)	Temp (°C)	Drying time (h)	Moisture (%)
Mango slices (raw)	4.4	52	14	3.0	70	12	2.5	41	14	4.0
Mango slices (ripe)	4.9	55	7	12.0	70	7	8.0	42	7	13.0
Mango leather	8.5	55	8	9.0	70	7	8.9	43	9	10.0
Green peas	4.8	42	9	5.0	nil	nil	nil	28	10	7.0
Okra	3.6	51	10	9.5	68	9	7.8	45	10	10.9
Potato chips	1.7	57	4	5.6	73	3	4.4	44	4	6.0
French fries	2.8	52	10	5.3	63	8	5.1	43	10	7.0
Potato "papad"	0.8	48	5	7.0	55	4	5.0	35	5	8.0

* The data are the average of three observations.

Solar dehydrators are more efficient than open air drying; because of the preparation steps they also yield products that are clean, free from insect contamination, and of better quality. On the negative side, windy and cloudy days tend to limit the difference between internal dehydrator temperature and outside air temperature. Heat and air currents can be controlled. This Indian test indicates that only food products requiring temperatures less than 80°C can be dehydrated.

The authors believe that these solar dehydrators based on the sun's energy are useful for small-scale drying only.

The object of the research was to support rural agriculture in underdeveloped areas by increasing the yield and quality of agricultural products that can be preserved by drying. These solar dehydrators and their use have a military implication: Many third world countries and the USSR practice military farming as an important adjunct to the food supply of their armed forces. Local construction and use by military units would definitely enhance their capability to produce subsistence items for year-round feeding and operational reserves and lessen external logistical food support.

Japanese Firm Markets Shelf-Life Extender

The Toa Gosei Chemical Industry Co., Ltd., Tokyo, Japan, is marketing, under the trade name Vitalon, a shelf-life extender for packaged foodstuffs.

Vitalon is a deoxidant packaged in a resin-coated pouch, the size of an individual salt serving (fig 3). It is usually found packed with a variety of perishable and semiperishable food products. Vitalon is claimed to be a deoxidant that prevents oxidative changes in fats, vitamins, flavorings, and spices, and suppresses the development of mold and insect larvae.

The Japanese manufacturer compares the use of Vitalon to vacuum-packaging and certain types of gas packaging of food products. The various Vitalon formulas are to be used with products packaged in various impermeable polyfilms in normal atmosphere.*

Three Vitalon deoxidants are offered, each with unique characteristics for use in Japanese food industries. Vitalon L is designed to absorb oxygen in the atmosphere until only 0.1% or less remains. This process takes place within 1.5 days. This formula is recommended for use with nuts, potato chips, donuts, deep-fat-fried rice, crackers, cookies, fish pastes, butter, margarine, etc. It also inhibits mold and insect growth.

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*There is a potential military application of the Vitalon concept where central production commissaries prepare and prepackage meals and meal components for isolated site feeding.

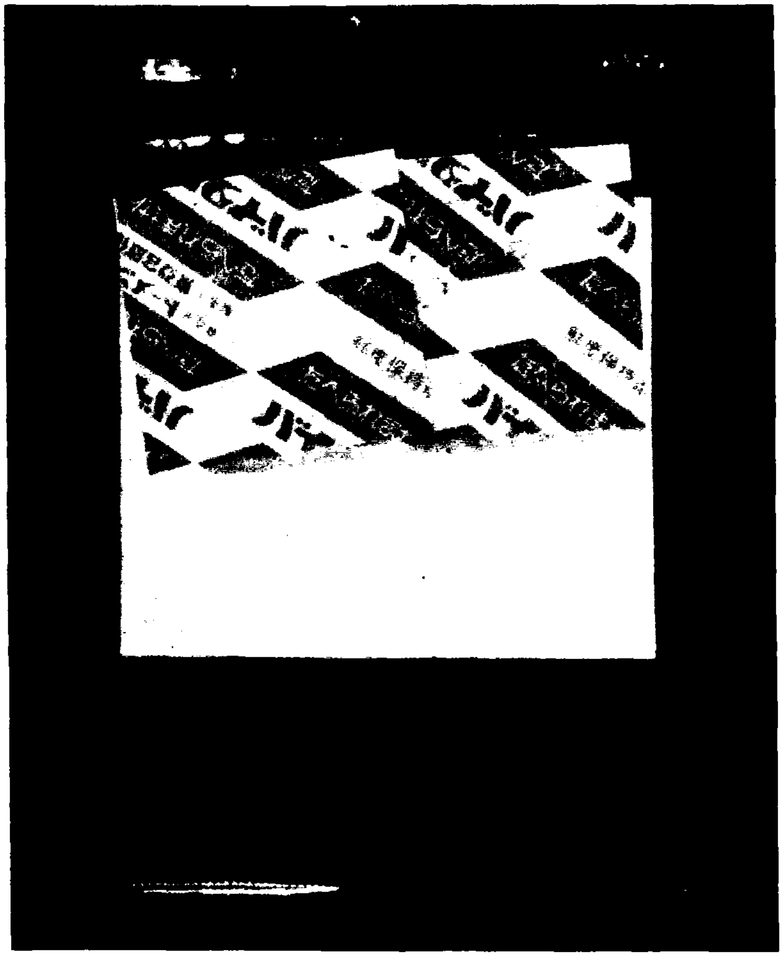

Figure 3. Vitalon Deoxidant Package

Vitalon LH is designed to reduce oxygen within 0.5 day after packaging for those products requiring a quick reduction in oxygen in the package. Vitalon G is called a gas exchange preserver. As it reduces the oxygen by absorption, CO_2 gas is evolved as the product atmosphere in the package. Vitalon G not only protects against oxidation of fat, but it is claimed to prevent growth of bacteria and mold. This variant is recommended for foods with a moisture content of 15% or more. The firm lists among its recommended products fish cakes, sausage, ham, and cheese.

The Japanese company claims that the Vitalon unit package does not contaminate the food products with which it is packed. They recommend that the Vitalon package be placed next to the air pocket in any packaging film used.

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APV Company Introduces Aseptic Processing System for Particulate Solids

Aseptic packaging--i.e., filling a presterilized container with a commercially sterile food product and sealing it in a sterile environment—has become an established canning method in the past 10 years for liquids, primarily milk products and fruit juices, and for products no more viscous than pudding. Further development of aseptic canning, including particulate solids and food products containing solid and liquid constituents, has not been successful because of the lack of a HT-ST[1] sterilizer capable of successfully sterilizing particulate solids without damaging the product.

The APV Company of the United Kingdom, after 10 years of collaboration with selected food companies, is introducing this year a new aseptic processing system for particulate-based products such as vegetables, meats, and whole fruits. Designated the Jupiter system, it combines a new rotary double-cone aseptic processing vessel (DCAPV) with other established forms of heat exchangers: e.g., the direct-steam-injection Uperiser (APV equipment) or Crepaco's[2] Ultratherm; the Rota-pro (manufactured by Crepaco) scraped surface heater; or devices utilizing indirect heating followed by regenerative cooling, such as APV's Ultramatic process or Crepaco's CTA process.

In the Jupiter system the processing of the liquid and solids is conducted separately so that each phase receives the optimum heat treatment. In particular, overcooking the liquid phase is avoided. The low shear action in the DCAPV minimizes damage to the cooked solids; still, the solid particles are uniformly heated, and consequently the product quality is superior to that of foods thermally processed by traditional methods. Other advantages of the Jupiter process include energy savings over in-can sterilizing methods, a choice of product containers, and a capability of being fully automated by linking with the APV ACCOS 2 microprocessor control system.

The central feature of the Jupiter process is the DCAPV, a rotating jacketed vessel, supported on bearings and with inlet and outlet trunnions through which flow the product, service fluids (heating and cooling liquids and cooking stock), and air. The DCAPV operates in the following manner:

- After top loading, the solids are heated by direct steam in the vessel's headspace and by indirect jacket heating while the vessel is rotating between 2 and 20 r/min. During the heating cycle preheated liquid (water or stock) may be injected into the vessel to insure optimum cooking conditions and, in some instances, to protect fragile products from damage.

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[1] High temperature-short time.
[2] Crepaco Inc., Chicago, is a US subsidiary of APV Holdings, Ltd.

- When the required heat treatment has been achieved, the product is cooled by replacing steam with cooling water in the jacket and by admitting sterile air into the vessel, which is maintained at a small positive pressure to insure sterility during the remainder of the process cycle.
- At the end of the cooling cycle, any excess liquid is removed from the now stationary vessel.
- Sauce, which has been sterilized by a HT-ST process for liquid and is normally incorporated into the Jupiter system, is supplied to the cooked, cooled solid product and mixed by vessel rotation under the sterile air blanket.
- The sauce and solids are transferred to a reservoir under sterile air pressure for subsequent aseptic package filling.

The Jupiter process is suitable for sterilizing most vegetables, with proven application to asparagus, onions, and cauliflower. The natural flavor and physical structure of the raw vegetable are retained because of the rapid cooking and cooling. Meat products are similarly processed, but allowance is made for the extraction of water soluble compounds by the condensate produced during sterilization. Fruits and other acid foods require a lower temperature level for sterilization and a correspondingly shorter process cycle. Conventional syrup processing removes the need for both the sauce sterilization plant in the system and the cooking liquid injection and removal stage.

Several commercial and pilot-plant operations are in service, including a commercial one at Nestlé SA, Beauvais, France. To date all the Jupiter plants have been manufactured in Crawley, England, although there is potential for manufacturing in the facilities of APV's subsidiary companies.

New Defence Food Laboratories for Australia

Food Technology in Australia[1] has reported on the expansion of research facilities at the Armed Forces Food Science Establishment at Scottsdale, Tasmania. The Australian establishment has been located at its present site since 1954. The new facilities are a new laboratory and library building of 650 m^2. They opened in August 1980 and are now fully operational.

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[1] Vol. 33, No. 4, Apr 1981, p 195.

Currently the Defence Food Laboratories have a staff of 33 (28 civilians and 5 military personnel). The basic mission of the Laboratories is to determine the energy and nutrient requirements of the Australian serviceman under all foreseeable operational environments and to translate these requirements into ration scales and operational rations. Activities range from the study of feeding systems in fixed mess halls to the development of operational rations for combat and of survival rations. In addition to design and research activities, some experimental processing and packaging of rations is accomplished.

The Armed Forces Food Science Establishment is organized into four technical sections in addition to an administrative section:

- Food Technology and Experimental Processing
- Food Science
- Nutrition and Physiology
- Engineering

The Food Technology and Experimental Processing Section concentrates on the research, development, and production of processed foods. This section has a pilot plant for experimental processing. Major recent activities have concentrated on the development and production of dehydrated foods used as components in Australian rations. Dehydration by freeze-drying has been a major program, and the pilot plant produces freeze-dried items for a special patrol ration.

The Food Science Section analyzes food for protein, fat, ash, minerals, and vitamins. The new facility's additional analysis can take place for trace metals, fiber, pesticides, and other compounds in both food and packaging. Microbiological examinations are conducted in this laboratory. This section also develops laboratory techniques used in the preparation of standards and specifications used in food procurement.

The Nutrition-Physiology Section studies the amount of food required by the serviceman in various activities and environments and in determining the effectiveness with which it is used. Studies are made on food consumption, waste, and acceptability for all feeding situations. Physiological study areas include evaluation of food and nutrient requirements and particularly water requirements of servicemen under stress and survival conditions. The new laboratories include an upgraded area for nutrition and physiological testing.

The Engineering Section is a workshop for package development, pilot plant support, and laboratory support.

Soviet Military Menu Planning

Troop feeding procedures in the Soviet Union require the publication of a weekly menu. Table III is an example of a week's menus in the winter for the Soviet conscript soldier in Eastern Europe. The meals, name of courses, food products, allocation per individual, and weight in grams are Soviet norms in troop feeding and reflect their subsistence doctrine for the military. The Soviet naval personnel ashore and afloat also follow similar guidelines and policies.

The norms for a day's supply of ration items are developed by the Directorate of Ration Supply of the Ministry of Defense and are based primarily on the caloric requirements of military personnel. These norms are approved by the Council of Ministers of the USSR and announced by orders of the Minister of Defense.

The preparation of menus and the subsequent cooking plans are followed by Soviet menu planners. The menu cycle is weekly, and menu planning does not allow the same dish to be served more than two or three times a week. When planning for the cooking of foodstuffs, the previously established weekly norm of potatoes, vegetables, groats, macaroni products, and flour must be used. The menu plan takes into consideration the availability of items from the supporting subsistence supply point. Additional items may be considered if the organization's kitchen is supported by a kitchen farm or local purchase is available.

When three meals per day are fed, the calories for the day are distributed approximately as 30% to 35% breakfast, 40% to 45% lunch, and 20% to 30% supper. If the interval between breakfast and lunch is very long, one-third of the calories is planned for breakfast.

Guidelines for the daily norm of meat and fish should be distributed in grams as follows:

	Name of Item	Breakfast	Lunch	Supper
First Alternative	Meat	50	100	—
	Fish	—	—	100
Second Alternative	Meat	—	100	50
	Fish	100	—	—
Third Alternative	Meat	100	—	50
	Fish	—	100	—

Vegetable oils should be planned for use with fish, vegetables, or salads. Animal fats are used primarily with meat dishes, soups, and stews. Wheat flour is used as a thickening agent and also as a coating for fried fish. Salt is used to taste, approximately 1% of the weight of the dish. The sample menu requires 30 grams per man per day of salt added during preparation of the food. By comparison, according to the National Research Council's recommended dietary allowance,[1] US adults with free access to salt will consume between 2.3 grams and 6.9 grams per day. Soviet soldiers do not have free access to salt; salt is put into their foods during preparation.

Leaves, pepper, and mustard are used to improve the flavor of certain dishes. Vinegar is used in making salads, as a garnish on herring or other fish, and in borscht. Tomato paste, onions, and carrots are used primarily in the preparation of soups, some salads, and some stews. It is Soviet subsistence policy when preparing menus to take into consideration the likes and perferences of the men being fed.

The menu is made up in three copies: The original is kept in the ration supply office that orders the food components; one copy is hung in the messhalls; and the third copy is given to the kitchen for guidance in preparing the food from recipe cards.

In menu planning and in the cooking of foodstuffs, seven dishes are considered primary, all others secondary. The terms "primary" and "secondary" do not relate to terms most Western planners would use in menu construction. The Soviet Armed Forces have devised a system of calculating the final net weight of a prepared dish that can be used in the calculation of food value in terms of protein, fats, carbohydrates, calories, and selected vitamins. Thus a primary dish is made up of groats, vegetables, and potatoes. A secondary dish is based on the weight of meat and fish after cooking by various methods.

The weekly menu is the significant document that records the plan for feeding for the week. From the Soviet point of view, it is the guide for food supply, menu preparation, nutritional analysis, and troop acceptance.

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[1] Ninth Edition, 1980, pp 169-70.

Table III. Food Products and Thei

Days of the week	Meals	Names of Courses	Bread; rye or coarse wheat	Bread; refined white wheat	Wheat flour	Rice	Cereal Grains				Pasta	Meats-Fish					Fats			Sugar
							Buckwheat	Millet	Barley	Wheat		Meat	Canned meat	Peas	Fish	Canned fish	Animal fats	Butter	Vegetable oil	
Monday	Breakfast	Boiled meat with rice kasha			5	70						50					10			
		Bread, butter, sugar, tea, eggs	150	150														20		25
	Dinner:																			
	Appetizer	Salad of pickled tomatoes																	5	
	1st Course	Macaroni soup, type m/b									40						10			
	2d Course	Stewed meat with buckwheat kasha			5		80					100					10			
	3d Course	Compote, bread	150	100																15
	Supper	Fried fish with fried potatoes			10										100				15	
		Bread, sugar, tea	150	150																25
		Lemonade, cookies, candies, apples																		
	Total of allotted food products, for the day:		450	400	20	70	80				40	150			100		30	20	20	65
Tuesday	Breakfast	Sailor's macaroni			5						80	50					10			
		Bread, butter, sugar, tea, eggs	150	150														20		25
	Dinner:																			
	Appetizer	Salad "Vinaigrette"																	10	
	1st Course	Borshch, type m/b			5												10			
	2d Course	Pilaf				80						100					10			
	3d Course	Compote, bread	150	100																15
		Lemonade, cookies, apples, candies																		
	Supper	Fried fish with mashed potatoes			10										100				10	
		Bread, sugar, tea	150	150																25
	Total of allotted food products, for the day:		450	400	20	80					80	150			100		30	20	20	65
Wednesday	Breakfast	Boiled meat with wheat kasha			5					80		50					10			
		Bread, butter, sugar, tea	150	150														20		30
	Dinner:																			
	Appetizer	Salad of pickled vegetables																	10	
	1st Course	Meat, type w/b															10			
	2d Course	Stewed meat with barley kasha			5				80			100					10			
	3d Course	Starch jelly, bread	150	100																5
	Supper	Fried fish with mashed potatoes			10										100				10	
		Bread, sugar, tea	150	150																30
	Total of allotted food products, for the day:		450	400	20				80	80		150			100		30	20	20	65
Thursday	Breakfast	Gulash with millet kasha			5			75				50					10			
		Bread, butter, sugar, tea	150	150														20		25
	Dinner:																			
	Appetizer	Salad of fresh cabbage																	10	
	1st Course	Pea soup, type m/b												40			10			
	2d Course	Boiled meat with macaroni			5						80	100					10			
	3d Course	Compote, bread	150	100																15
	Supper	Fried fish with mashed potatoes			10										100			10		
		Bread, sugar, tea	150	150																25
	Total of allotted food products, for the day:		450	400	20			75			80	150		40	100		30	20	20	65

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r Weight in Grams, Allotted Per Person

			Vegetables						Other									Additional foods obtained by the Attendance Service (with the unit monetary fund)				Gross weight of the prepared dish (grams)	Weight of meat or fish portions (grams)
Tea, coffee	Starch jelly or fruit preserves	Salt	Potatoes	Cabbage, fresh or pickled	Beets	Carrots	Onions	Roots and greens	Tomato paste	Bay leaves	Pepper	Vinegar	Mustard powder	Eggs				Lemonade	Cookies	Apples	Candy		
0.5						10	5							2								350	
	20		125			10 20	10 5 10	55														70 700 350 250	
0.5			410															18	50	50	50	350	
.0	20	30	535			40	30	55	6	0.2	0.3		0.3	2									
.5						10	10							2								315	
	20		30 110	130	10 30	10 30	10 10	10										18	50	30	50	70 700 350 250	
.5			410																			350	
.0	20	30	550	130	40	40	20	10	6	0.2	0.3		0.3	2									
.5						10	5															350	
	30		140	130		20 20	10 10 10	55														70 700 350	
5			410															18	50	50	50		
0	30	30	550	130		50	35	55	6	0.2	0.3		0.3										
5						10	10																
	20		140	60		5 5	10 5 10																
5			410															18	50	50	50		
			550	60		20	35		6	0.2	0.3		0.3										

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Table III. Food Products and

Days of the week	Meals	Names of Courses	Bread; rye or coarse wheat	Bread; refined white wheat	Wheat flour	Rice	Cereal Grains				Pasta	Meats-Fish					Fat	
							Buckwheat	Millet	Barley	Wheat		Meat	Canned meat	Peas	Fish	Canned fish	Animal fats	B
Friday	Breakfast	Gulash with pearl barley kasha			5			70				50					10	
		Bread, butter, sugar, tea	150	150														2
	Dinner:																	
	Appetizer	Salad of pickled tomatoes																
	1st Course	Borshch, type m/b															10	
	2d Course	Boiled meat with wheat kasha			5				80			100					10	
	3d Course	Starch jelly, bread	150	100														
	Supper	Fried fish with mashed potatoes			10										100			
		Bread, sugar, tea	150	150														
	Total of allotted food products, for the day:		450	400	20			70	80			150			100		30	2
Saturday	Breakfast	Boiled meat with mashed potatoes			5							50					10	
		Bread, butter, sugar, tea	150	150														2
	Dinner:																	
	Appetizer	"Vitamin" (Salad)																
	1st Course	Pea (Soup), type m/b			5					40							10	
	2d Course	Bigos (Stew; "hot pot")										100					10	
	3d Course	Compote, bread	150	100														
	Supper	Fried fish with mashed potatoes			10										100			
		Bread, sugar, tea	150	150														
	Total of allotted food products, for the day:		450	400	20					40		150			100		30	2
Sunday	Breakfast	Sailor's macaroni			5						80	50					10	
		Bread, butter, sugar, tea, eggs	150	150														2
	Dinner:																	
	Appetizer	Vinaigrette salad																
	1st Course	Borshch, type m/b			5												10	
	2d Course	Pilaf				80						100					10	
	3d Course	Compote, bread	150	100														
	Supper	Fried fish with fried potatoes			10										100			
		Bread, sugar, tea	150	150														
	Total of allotted food products, for the day:		450	400	20	80					80	150			100		30	2

/

eir Weight in Grams, Allotted Per Person (Continued)

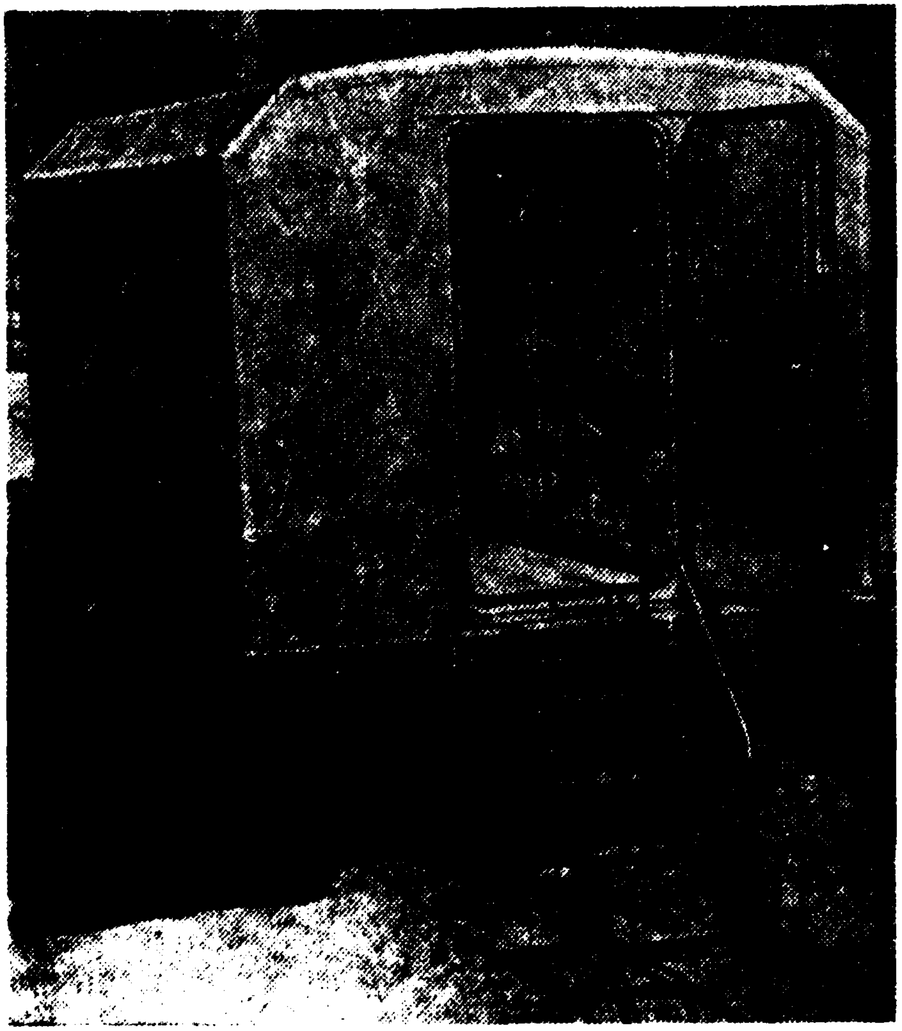
					Vegetables						Other									Additional foods obtained by the Attendance Service (with the unit monetary fund)				Gross weight of the prepared dish (grams
Vegetable oil	Sugar	Tea, coffee	Starch jelly or fruit preserves	Salt	Potatoes	Cabbage, fresh or pickled	Beets	Carrots	Onions	Roots and greens	Tomato paste	Bay leaves	Pepper	Vinegar	Mustard powder	Eggs				Lemonade	Cookies	Apples	Candy	
	30							20	10															350
5	5		30		130	150	45	20	5 10	60														70 700 350 250
15	30				410				10											18	50	50	50	350
20	65		30	30	540	150	45	40	35	60	6	0.2	0.3		0.3									
	25				300			10	10															320
5	15		20		140	60 450		10 10 10	5 5 10															70 700 340
15	25				400															18	50	50	50	350
20	65		20	30	840	510		40	30		6	0.2	0.3		0.3									
	25								5							2								300
5	15		20		20 100	150	40 40	10 30	5 5 10															70 700 350 250
15	25				410				5											18	50	50	50	350
20	65		20	30	530	150	80	40	30		6	0.2	0.3		0.3	2								

2

er					Additional foods obtained by the Attendance Service (with the unit monetary fund)				Gross weight of the prepared dish (grams)	Weight of meat or fish portions (grams)
Mustard powder	Eggs				Lemonade	Cookies	Apples	Candy		
									350	
									70 700 350 250	
					18	50	50	50	350	
0.3										
									320	
									70 700 340	
					18	50	50	50	350	
0.3										
	2								300	
									70 700 350 250	
					18	50	50	50	350	
0.3	2									

Soviet PS-2 Food Storage Trailer

The Soviets have announced the introduction of a food storage trailer designated the PS-2 (fig 4). It is self-contained in a box-bodied van that is mounted on a single-axle trailer, the 1-P-2.5M. It was designed to be used with the PAK-200 field kitchen truck (fig 5). The trailer is set up like a pantry, with storage cabinets and two ice boxes consisting of metal vessels surrounded with a special solution that absorbs cold and transfers it to the food contained within the vessels.



Neg. 530899

Figure 4. Soviet PS-2 Food Storage Trailer

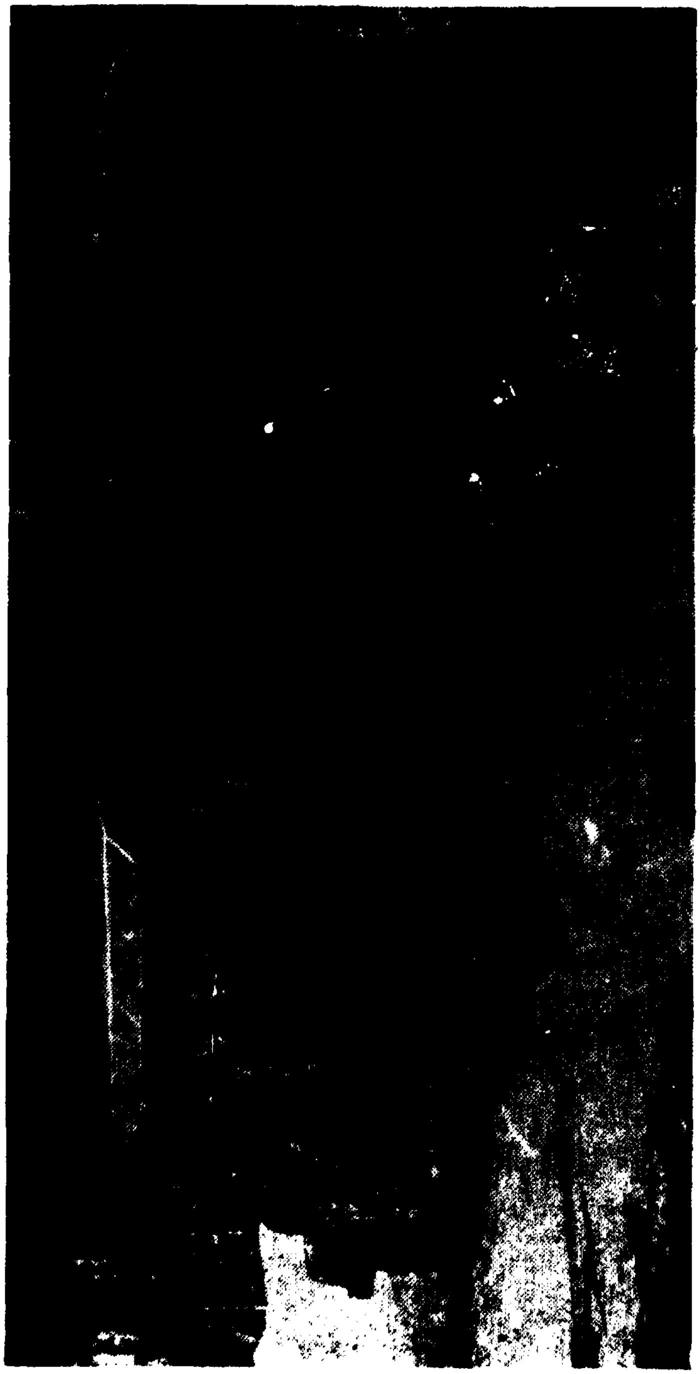


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Figure 5. PS-2 Towed by PAK-200

This food storage trailer van increases the food storage capacity while maintaining the mobility of the PAK-200 field kitchen truck. The pairing of the PAK-200 and PS-2 should be beneficial in cold weather operations by providing protected work and storage space. Protection in CBR-contaminated areas is also provided and both vehicles can be easily decontaminated. The ice boxes are new to Soviet field feeding equipment; they may be the new isothermic container, KI-50, described previously in this publication.[1] If this is true, the "special solution" is 0.5% aqueous potassium bichromate.

The PAK-200 kitchen, when first introduced into the inventory, was assigned one to a tank battalion. Now there is evidence that they are also being issued to motorized rifle battalions. (The Soviets feed at the battalion level but plan for enough kitchens to allow cooking at the company level if necessary.)

Nestlé Develops Civil Defense Shelter Survival Rations

The Nestlé Company of Vevey, Switzerland, in cooperation with the Swiss Federal Office for Civil Defense, has developed survival rations for use in civil defense shelters. The rations were scheduled to be available to the Federal Civil Defense Office in September 1981.

About 15 years ago, the Swiss government asked the food industry to develop some food products that could be stored in air raid shelters and consumed by shelter inhabitants during the critical days following a nuclear attack or accident. The product was required to have a neutral taste, be nutritionally adequate, have a low volume, and be packaged for easy storage, opening, and eating. The product was intended to be used only when survival demanded its use, when nothing else was available to eat.

In response to these requirements, the Nestlé Company produced a product called "Pemmikan"* that meets these criteria. It consists of a water-soluble powder produced in two variants:

- Sweetened--suitable for breakfast and has the following ingredients: sugar, chocolate, lecithin, vanilla, and cinnamon. It is packaged in 750-gram cans.

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[1] Vol 4, No. 1, p 5.

*The product was named after the American Indian foodstuff pemmican, made from wild berries pounded into buffalo meat shreds, bound together with tallow. Early US Armed Forces' survival rations often included pemmican made from various formulations. None is known to have been popular with US soldiers.

- Salted--suitable for midday and evening meals and has the following ingredients: soya flour, fortified wheat flour, vegetable oil, yeast, glutamate, bran, finely ground spices, and antioxidants. It is packaged in 4.5-kg cans.

Pemmikan can be prepared in several ways--with warm or cold water, as soup or a puree; it can be prepared with vegetables or other spices, if available.

Fifty grams of the sweetened and 300 grams of the salted Pemmikan will provide 1600 kilocalories, a tolerable caloric intake for an adult male confined to a shelter. The nutritional quality of Pemmikan is quaranteed for 10 years, but only if it is stored according to the prescribed conditions of humidity and temperature.

Feeding trials have been conducted with the product. Students of the Insuspital (hospital) in Bern consumed only Pemmikan for 2 weeks without negative effects. In a test sponsored by the Federal Office of Civil Defense, 30 people between the ages of 9 and 60 spent 3 days in a 32-m^2 shelter, subsisting only on Pemmikan. Medical examinations after the trial revealed no problems and indicated that the body can assimilate the food product very well.

According to Swiss press reports, enough Pemmikan is being produced to feed the entire Swiss population for 3 days, if required.

The use of a fabricated food product for civil defense survival rations is a more efficient and less costly method than maintaining stores of frozen meat and other less perishable (than meat) foodstuffs for use in the event of war. The USSR and other Eastern European Communist (EEC) countries use the latter method and are saddled with the problems of rotating stock with varying storage periods from months to about two years. None of the EEC countries is known to have developed survival rations consisting of fabricated foods. This Swiss product is reminiscent of the nutrition supplement powders produced in the United States and western Europe for special feeding purposes, such as for hospital patients, the elderly, infants, and athletes. The Nestlé Company is a well-known manufacturer of these kinds of products, and it is therefore not surprising they were successful in developing this product for the Swiss government.

Japanese Study Foods Affecting Coronary Heart Disease Risk Factors

It is estimated that about 50% of the risk of coronary heart disease (CHD) can be explained by the following factors: maleness, family history, hypertension, obesity, diabetes, cigarette smoking, and hypercholesterolemia (excess cholesterol in the blood). Statistics indicate that from 1959 to 1973, the CHD death rate among males 45 to 54 years old declined in Israel, the United States, Australia, and Japan but increased in the majority of European countries. Japan had the lowest death rate per 100 000 population (30.7) among the 18 countries providing data. The next lowest rate, 107.5, was found in Switzerland. (Switzerland however, was among the countries reporting an increase in the CHD death rate.)[1] Another source reports that both Japan and Switzerland are experiencing major long-term declines in death rates from all types of heart disease despite rises in animal fat consumption in both countries.[2]

The Japanese are attempting to determine why they have such a low death rate from CHD. Similar low rates are observed in other Asian countries. A number of papers have been published by the Japanese concerning the ability of certain dietary components to lower blood cholesterol and triglyceride levels.[3]

A paper in the Journal of the Japanese Society of Food and Nutrition[4] describes an investigation of the contribution that seaweed in the Japanese diet may make in lowering serum cholesterol levels. Seaweeds are used extensively in traditional Japanese cuisine. They are used, for instance, as condiments, as wrappings for pieces of raw fish and rice, and in soups.

In these particular experiments by Shizue Ishii, Tadao Hasegawa, and Takao Suzuki in the Department of Agricultural Chemistry at the Tokyo University of Agriculture, rats were fed a standard synthetic diet containing 1% cholesterol and 0.25% bile salts, to which was added the test substances at a level ranging from 2% to 5% of the diet: the sea plants kirinsai or wakame, an ethanol and ether extract of powdered kirinsai, or pectin.

Many sea plants contain viscous substances, which are extracted and processed into hydrocolloid gums that are used as thickening agents in certain food formulations. It is the gums in seaweed that are believed to be the responsible component for the hypocholesterolemic effects of kirinsai. For this reason, an ethanol-ether gum extract of kirinsai was tested. Pectin, another hydrocolloid but derived from land plants (fruits), was also tested because it has been shown to depress blood cholesterol levels in man and animals when included in the diet.[5-7]

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[1] Nutrition Today, Vol 15, No. 3, 1980, pp 12-19.
[2] Consumer Reports, Vol 46, No. 5, May 1981, pp 256-260.
[3] Foreign Food Technology of Military Significance, Vol 4, No. 1 (6 March 1981), p 18.
[4] Vol 33, No. 5, 1980, pp 277-281.
[5] Leveille, G. A. and H. Sauberlich, J. Nutrition, Vol 88, 1966, p 209.
[6] Jenkins, D. J. A., A. R. Leeds, C. Newton, and J. H. Cummings, Lancet, 1, 1975, pp 1116 and 17.
[7] Keys, A., F. Grande, and J. T. Anderson, Proc. Soc. Exp. Biol. Med., Vol 106, 1961, pp 555-558.

The results of these Japanese studies showed that kirinsai and wakame lowered the serum cholesterol of rats fed a high cholesterol diet but did not affect the ratio of total liver cholesterol to ingested cholesterol. When the gum extract from kirinsai or pectin was fed, there was an even greater depression of the serum cholesterol level as well as a decrease in the ratio of total liver cholesterol to ingested cholesterol. When the previously cholesterol-fed rats were placed on the basal diet (no cholesterol) with and without 5% kirinsai added to the diet, those rats receiving the seaweed removed liver cholesterol faster and decreased their serum cholesterol levels quicker than the controls for up to a period of 10 days, at which time the levels of the two experimental groups began to converge.

These experiments raise a number of questions: Can these results be obtained in humans? Do the levels of seaweed gum extract or pectin used in these diets represent realistic utilization levels in human diets? (On the other hand, a diet containing 1% cholesterol is not realistic, either.) If the hydrocolloids levels are high, what then might be the negative effects of using high levels of these substances in human diets?

East German Nutrition Norms and Combat Rations

Concurrent with the introduction of new military field feeding equipment, the East Germans have also made substantial improvements in their military rations. Several articles have been published in the last 3 years in Zeitschrift fur Militaermedizin: a description of new nutritional norms for the National People's Army (NNA) and the Border Troops[1]; a review article by Prof. Dr. Habil A. Ketz of the Central Institute for Nutrition of the Academy of Sciences of the German Democratic Republic (GDR), Potsdam-Rehbreicke, concerning the relationship between nutrition and performance with recommendations for the military[2]; and an evaluation by COL D. Drecoll, MD, of the nutrient content of the NVA combat rations.[3] These papers all reference US Army research as well as that of western European countries.

Considerable effort apparently went into the determination of the nutrition norms, which were published in 1979. They were derived from recommendations for the GDR population (published in 1963), along with a determination that certain nutrients need to be increased because of the nature of military activity. Table IV shows the GDR norm established for a 68-kg male between the ages of 18 and 35 years at various degrees of activity.

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[1] Vol 20, No. 4, 1979, pp 155-157.
[2] Vol 20, No. 4, 1979, pp 158-161.
[3] Vol 21, No. 2, 1980, pp 60-62.

Table IV. GDR Nutrition Norms for 68-kg Males, 18 to 35 Years

Activity	Energy		Protein		Fat		Carbohydrate	
	kcal/kg weight	kcal/day	g	% of energy	g	% of energy	g	% of energy
Light	40	2700	85	12	95	33	360	55
Medium light	44	3000	85	12	105	33	400	55
Heavy	53	3600	105	12	135	35	470	53
Very heavy	62	4200	125	12	160	35	540	53

The above recommendations for carbohydrate consumption were derived empirically from GDR national eating habits. The guideline is 45% to 60% carbohydrate. The only mineral recommendations are for calcium, phosphorus, and iron (800 mg, 1200 mg, 10 mg respectively) because, while the other minerals are recognized as being essential, not enough is known about their absorption and interactions to state a recommendation. Eight hundred µg of retinol equivalents are recommended to satisfy the requirement for vitamin A; it does not account for food preparation losses of 20%. The requirements for thiamine and riboflavin are referenced to the energy intake, 0.5 mg of thiamine/1000 kcal and 0.6 gram of riboflavin/1000 kcal. Again this does not allow for 20% to 25% losses during food preparation. Forty-five mg of ascorbic acid are recommended to maintain saturated tissue levels. The recommendation increases to 55 and 65 mg/day with heavy and very heavy physical work. Levels for niacin are not given because the usual diet contains sufficient niacin and tryptophane from the protein (1% to 1.4%).*

What apparently concerned GDR military nutritionists the most was the energy level that should be provided to the troops. A nutrition study conducted in 1976-77 determined the net food consumption in troop units fed standard diets #110 (4200 ±200 kcal), #130, #140, and #150 (energy standard not provided for the last three diets). The food issued was weighed, as were kitchen wastes and noneaten food, including plate waste. The nutrient content was determined from food tables. The data were averaged over a month, and each season of the year was included in the data collection. Weight gain of the troops was used to determine whether the diet standard met or exceeded the energy requirements. Those consuming diets #140 and #150

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*60 mg tryptophane = 1 mg niacin.

received an average of 4630 kcal daily. At the end of a year 35% of these subjects were overweight, whereas only 6% started out overweight; 5% remained underweight throughout the experiments on all diets. With the less calorigenic diets, basic standards #110 and #130, the intakes were 4070 and 4120 kcal daily, respectively, and the subjects on the whole did not show a change in weight distribution from the beginning of the test period--i.e., 80% normal weight, 5% underweight, and 15% overweight. Based on these results, as shown in table V, the Basic Standard Diet #110 was revised in 1978. The calories were set at 4000 kcal, the percentage of fat was increased from 33% to 35%, and the vitamin content was stipulated according to civilian recommendations.

Table V. Nutrient Intake, Theoretical, Actual, Recommended (Annual Average)

Nutrient	Unit	Basic Standard Diet #110 (1976)	Actual average consumption daily	Revised basic standard diet (1978)
Energy	kcal	4200 ±200	3735-4042	4000
Protein	g	130 ±10	108-119	115
% of energy		13 ±1	11.5-12.1	12
Fat	g	150 ±10	156-165	150
% of energy		33 ±3	38.2-38.7	35
Carbohydrate	g	550 ±50	453-489	520
% of energy		54 ±4	49.5-50.0	53
Calcium	mg	800	796-868	800
Phosphorous	mg	1200	1971-2156	1200
Iron	mg	12	25-26	12
Vit. A	IU	5000	5910-6870	
	mg			800
Vit. B_1	mg	2.5	1.9-2.2	2.0
Vit. B_2	mg	2.5	2.1-2.3	2.4
Niacin	mg	28	20-23	--
Vit. C	mg	70	115-157	65

COL Dr. D. Drecoll, who wrote two of the three articles in *Zeitschrift für Militaermedizin* and who appears to be the nutrition expert for the GDR Medical Service, recommended that more nutrition education be provided army and border troops, especially in regard to ways of controlling overeating and the resulting weight gain. This was directed especially at career officers, officer candidates, and noncommissioned officers whose activity level and age require less than the Basic Standard Diet #110. About 3000 kcal are recommended for these groups. Patients in stationary treatment or bedridden (except burn victims) should receive about 2400 to 2700 kcal.

The paper by Prof. Dr. H. A. Ketz from the Central Institue of Nutrition was a tutorial article prepared for the GDR military readers outlining the rationale used in establishing nutrition norms. The title of the article suggests the author is going to describe how diet manipulation or optimization can improve physical performance, based on research conducted at the Central Institute of Nutrition. However, the article includes only a reiteration of the state-of-the-art of feeding athletes and some of the biochemical investigations that have been conducted.[1] The author appears to recommend glycogen loading, a technique that most sports nutritionists believe is controversial if not potentially harmful.

In COL Drecoll's second article the basic nutrient content of combat rations is given (table VI).

Table VI. Nutrient Content of GDR Combat Rations

	Energy	Protein		Fat		Carbohydrates	
Designation	kcal	g	% of energy	g	% of energy	g	% of energy
Komplete Rations: Ration units L5 and L10	4353	117	11.1	165	35.5	562	53.4
K-Portion 1	4209	97	9.6	200	45.1	456	45.3
K-Portion 2	4800	117	10.3	239	47.7	478	42.0
Ration unit P-1	3845	116	12.5	203	49.3	354	38.2
S-1 ration	4885	82	6.9	310	59.8	391	33.3

The L5 and L10 are ration units for groups of 5 and 10 people. The hot food components are suitable for preparation in field kitchens, including ready-to-cook ingredients, canned meat, and ready-to-cook soups. Additionally there is canned fruit, instant tea or coffee with sugar, single portions of ready-to-eat items such as canned sausage and other meat products, jam, crackers, and vitamin C tablets. Fresh or long-storage bread (500 g/day)

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[1] See Nutrition Today, Vol. 14, No. 6, Nov-Dec 1979, an issue devoted to food and sports.

must be issued with this ration. The K-Portion is an individual ration that provides ready-to-eat items, canned sausage, crackers, compressed cookies, instant tea with sugar, and vitamin C tablets or candies. Included in the ration are sterno blocks, matches, and a piece of steel that is bent to form a stand for a can. The K-Portion 2, introduced in 1977, included more calories. Substituted for the crackers and cookies was a 500-gram can of whole grain bread and greater quantities of ready-to-eat items and canned sausage. The packaging was improved to "provide greater protection against the effects of weapons of mass destruction." The K-Portion 2 is intended for general use and is to be transported in vehicles with the unit.

Figure 6 is a photo of K-Portion 4, believed to be menu #4 of K-Portion 1. Not included in the photo are the can of lentils and bacon (400 grams), a can of smoked sausage (90 grams), a can of liver sausage (90 grams), a package of compressed biscuits (75 grams), a packet of fuel, and the cooking frame. The shelflife of each component, as well as the date the ration was produced, is given on the ration label. The packaging of the cereal includes aluminum foil. The cans with 90-gram capacity are made of aluminum. The ration is overwrapped with polyethylene and heat sealed. The precision and mismatch of the shelflives of the components is remarkable. There is potential for improvement of the ration by increasing the shelflife of some components to match that of others. Economic considerations may be a factor in this regard.

The following is a listing of the contents of K-Portion 2/2 with the usable period:

1 400-g can of lentils and bacon	18 months
1 400-g can of peas	18 months
1 500-g can of whole grain bread	12 months
1 230-g can of lightly smoked sausage	24 months
1 210-g can of home-style sausage	24 months
2 25-g sachet of instant tea	14 months
2 50-g vitamin C drops	14 months
3 slabs of "Pyrofix" solid fuel	26 months
1 10-tablet strip of water purification tablets	26 months
1 book of matches	26 months
1 steel cooking stand	26 months

The P-1 Ration unit is intended for a tank crew. For each crew member there is food for two warm meals (the food may also be consumed cold). Included are whole grain bread, ready-to-eat items, canned sausage, instant tea, other beverage mixes, and snack items. The S-1 rations are canned and concentrated foods and luxury items sufficient for 2 days of individual requirements, such as ready-to-heat soups, canned meat and sausage products, compressed food bars, chocolate, instant tea with sugar, vitamin C tablets, and so forth. These operational rations provide the nutritional requirements for heavy physical work.

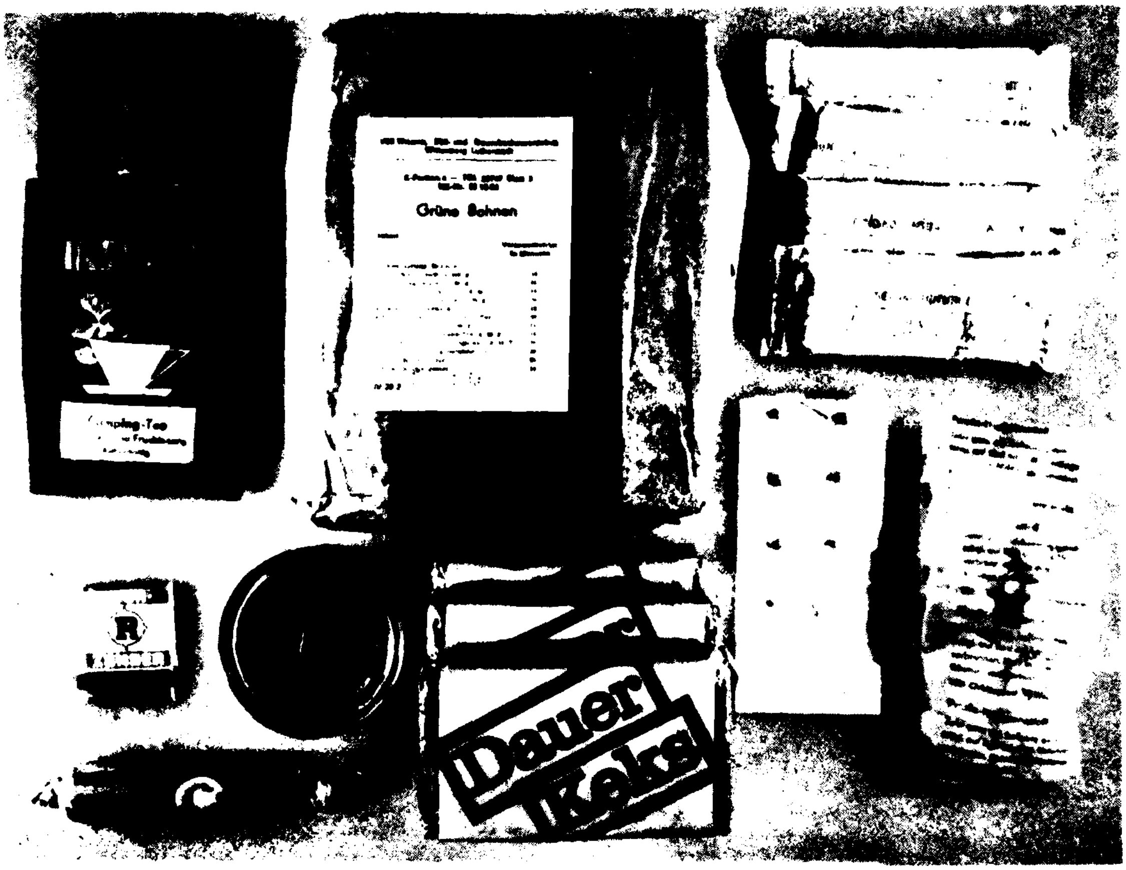

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Figure 6. K-Portion 4 (Green Bean Menu), East Germany

Diet of Students at the Japan National Defense Medical College Analyzed

The Japan National Defense Medical College furnishes all meals (in principle)[1] to its students during their enrollment of 6 years. Because this 6-year period falls within a time of the student's life when rapid physical and mental development is occurring, Japanese military medical authorities decided to investigate whether the nutritional requirements of the young men (average age, about 20 years) were being met according to Japanese nutrition standards (revised in 1975) for males, 20 years old, engaged in heavy labor.

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[1] While all meals are furnished, it cannot be assumed that the students do not obtain some food from other sources. This article is, therefore, a discussion of a diet offered rather than consumed.

The analysis was conducted on a 1-month menu. The nutrient content was calculated using Japanese food tables. The results, average daily intake per student, are shown in table VII.

Table VII. Nutrient Consumption of Medical College Students

	Japanese standard*	Students' diet	US RDA***
Energy (kcal)	3400	3228 ±394	2500-3300
Protein (g)	125	109 ±26	56
Fat (g)	75	99 ±37	N/A
Vitamin B_1 (mg)	2.0	1.6 ±0.4	1.5
Vitamin B_2 (mg)	2.0	1.7 ±0.6	1.7
Vitamin C (mg)	90	152 ±64	60
Vitamin A (IU)	2500	2385 ±1594	5000 IU
Vitamin D (IU)	**	69 ±115	300 (7.5 μg)
Nicotinic Acid (mg)	**	22 ±6	19
Calcium (mg)	900	841 ±293	800
Iron (mg)	**	18 ±6	10

*Males, age 20, very active.
**Not given in source; may not be established for this group.
***US recommended daily allowance for males, age 19-22, weighing 70 kg, 177 cm height.

The quantity and quality of protein (46% from animal sources) in the diet is considered good.

The percentage of energy derived from fat is 27.5 and is within the limits of 25% to 30% given in the 1975 revision of the Japanese nutrient requirements for youth performing heavy labor. (These standards recommend 20% to 25% energy from fat for adults in the general population, which is much less than most Americans consume.)

The students' calcium intakes fall between the levels recommended by Japanese and US authorities. The Japanese investigators expressed some concern about dietary calcium phosphorus ratios because of the addition of phosphates to processed foods, which are increasingly being consumed by

Japanese young people. To counter the increasing amounts of phosphorus in the Japanese diet, nutritionists are recommending higher levels of calcium to maintain the calcium-phosphorus ratio at about 1:1.

Since calcium absorption in the gut is dependent on the presence of a sufficient quantity of vitamin D, the low level of vitamin D in the students' diet could be of concern. One hundred IU are considered necessary to prevent rickets and insure adequate absorption of calcium in the intestinal tract. Some vitamin D is synthesized in the deeper layers of the skin exposed to ultraviolet radiation. In areas (such as Japan) where sunlight is limited seasonally, or where there is atmospheric pollution, and in persons with heavily pigmented skins, insufficient quantities of vitamin D would be formed.

The results from this investigation led to a recommendation that greater quantities of vitamin D and calcium-rich foods such as fish and egg yolks be included in the menus.

US nutritionists would note that the students' vitamin A intake is minimal, adequate to maintain blood concentration of vitamin A metabolytes and prevent deficiency symptoms, but that a higher intake is necessary to produce liver storage of this vitamin. It is an anomaly that the students' requirements were compared with those of young people performing hard work. Medical students, as we know them, lead sedentary lives, studying long hours.

China Imports Western Packaging for Export Products

China has set up a special organization, the National Export Commodities Packaging Corporation of China; to advise and assist factories in overcoming packaging problems for export of foods and pharmaceuticals. In 1980, China exported approximately 15 billion dollars worth of products and commodities. US imports totaled over $1 039 200 000, of which $133 108 000 was in agricultural commodities and foodstuffs in over a dozen categories. The importation of Western packaging materials, equipment, and equipment design allows Chinese firms to complete in the world market.

French Retort Pouch Entree Introduced

The French food company, Flodor, located at 202 Bureaux de la Colline, 9221313 Saint-Cloud, France, has introduced a potato dish in a retort pouch. The dish, based on the Swiss specialty Rosti, is made with grated potatoes, bacon, cheese, flavorings, and spices. The company claims a shelflife of up to 6 months without refrigeration.

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Soviet GOST Standards

The Soviet Union has developed its own set of national food standards for food products and food analytical techniques. Two standards are given below, one for canned meat and one for goulash.

Canned Meats

Union of Soviet Socialist Republics, Gosvdarstvennyi
Komitet SSSR po Standartam
Soviet Standard GOST 9937-79, 4 pp (1979)

This standard, which supersedes GOST 9937-62 and GOST 13102-67, applies to canned meats prepared from meat, bread flour, dried onion, spices, and salt. It prescribes three types of meat--beef, pork, and mutton--and covers other ingredients and general requirements for processing, specifying meat content (≤70%), sauce content (≤30%), cooking salt (1.0% to 1.8%), and tin salts (≤200 mg/kg). Lead salts are not permitted. Testing methods, packaging (cans), transport and storage (up to 2 years in cans, up to 3 years in glass and bulk containers) are also covered.

Canned Meats: Goulash

Union of Soviet Socialist Republics, Gosvdarstvennyi
Komitet SSSR po Standartam
Soviet Standard GOST 7987-79, 4 pp (1979)

This standard, which supersedes GOST 7987-62, applies to canned meats *prepared* from beef, pork, or mutton, with tomato paste, flour, boiled onion, and spices in hermetically sealed and sterilized containers, and covers terminology (beef, pork, or mutton goulash), categories of meat permissible, sensory requirements, testing methods, packaging, transport, and storage (<1 year in cans, <3 years in glass, and <1.5 years in bulk containers). Specific requirements include: meat content, <70% net weight; sauce, <30%; sodium chloride, 1.0% to 1.6%; tin salt, <200 mg/kg; copper salt, <8 mg/kg. Lead salts and foreign substances are specifically prohibited.

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